Network-Enabled Open Education:
Changing the Landscape of Learning Opportunity

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It is always difficult following someone like Dave Pritchard, who is a deep practitioner, who thinks about the problems and thinks about the solutions. I am going to go from that stark reality to wildly optimistic notions. First of all, I just want to say it is wonderful seeing you folks after the last two years. I was gushing to Dick and Liz earlier on how nice it was to meet so many old friends, and make new friends. All of us are in this common journey. It is really tremendous.

I am a futurist also, but of a different kind. Actually, my doctoral work was in this program called the Futures Studies Program, where we didn't talk about inventing the future or predicting the future, but about making future possibilities more real for others. That is sort of the middle space of futurism that people like me occupy. We look at the real problems that Dave presents and then ask, "Are there some wildly optimistic technological solutions that might make some of those problems go away, or at least mitigate them mildly?"

What I want to do today is actually give you some sense of the potential of another disruptive innovation that has been talked about by various people in the last few days—a disruptive innovation that I call network-enabled open education. I will try to illuminate the value proposition of this disruptive innovation. At the end, I hope to speak to something that both Michael and Dave touched on, which is the readiness, the cultural readiness, for us as individual instructors, institutions, organizations and nations to really take advantage of this disruptive innovation.

I am going to vehemently affirm several things that folks have said, from President Vest , Cathy Casserly , Andy Di Paolo and some others. There is going to be a vehement reaffirmation of some of these topics, perhaps illuminated by some examples. I will then discuss some things that are happening at MIT, and also give some examples, based on my work with India, where I have had the honor of serving on India's National Knowledge Commission as an adviser, thinking about open education resources and open distance education.

I am going to ask that you all think very generously about the definition of "open," not just as open content. Think about it as open content and open tools. Open education is not a new term. It has existed variously as "flexible education" and "university without walls." There have been different manifestations over time. I want to think of all these things when you think about "open"— open content, open tools, open knowledge, the enabling resources that actually make education open. When you think about the network— and this is something that really got highlighted by Andy yesterday— think about both the connectivity and the collectivity, as was pointed out. When we think about the network, think about wired, wireless, and mesh networks. The Kashmir example was pointed to yesterday, about the mesh networks being leveraged by buses to provide access to resources. Think also about the network of people, because one of the things

that we find going on is that there is this whole exploding set of communities that are being formed. These communities are part of the network that is really making it possible for us to realize this potential. This is sometimes comforting, because then we shift from solving all the problems technologically to enabling technology that will allow communities to solve several of the problems themselves. You have seen this in Clayton's original book about "the long tail," and all the stuff that can happen around the long tail. I want you to think about the network as both the technical substrate as well as this whole human capacity that is created.

So is there a disruptive innovation movement? This is probably the most used slide for all of us who give presentations in open education. It is interesting. MIT launched OpenCourseWare, and what has been following over the last four or five years is this wonderful, gathering storm represented by all these institutions. So it's not just MIT OpenCourseWare, which is dynamite as it is, but the fact that there are upwards of 200-plus institutions that are now part of this consortium. This is evidence that there is a significant open movement going on. The consortium is a very good representation. It epitomizes that movement. There are wonderful initiatives from all over the world. In fact, I have to keep updating the slide. Every time I go to another country and give a talk, another country pops up over here. This is a sign of the growing movement.

There is one initiative that I speak about because of my work in India. You will notice that there is something called NPTEL, which is the National Programme on Technology-Enabled Learning. Over the last six years, five Indian Institutes of Technology (IITs) and 2 other institutions have gotten together to create engineering courses for engineering institutions in India. All this is available through YouTube. Many, many countries, including India, are represented in this open education movement. So there is a tendency to make stuff that is newly created and to make it open and widely available. And this is not just for higher education. Yesterday we had several conversations, and I had to insert this slide around secondary education. So this phenomenon is not restricted to higher education. There are any number of growing repositories of resources available for K through 12, as we call it in this country, or secondary education elsewhere.

What is telling is that the resources are growing, institutions are participating, and initiatives are being created. From an institutional sense, you know that this is a significant movement when it is becoming part of the discourse for educational change institutionally and nationally. I have listed a whole bunch of organizations, some of whom I have worked directly with, like UNESCO, in developing their open suite. But the fact is that when people are talking about access and quality, when people are talking about participating in the growing knowledge economy—nations, institutions—for instance, a Commonwealth of Learning clearly identifies with openness. This is through a lot of pushing that Cathy Casserly and her colleagues did, looking at open education as a key strategy for meeting their aspirations and their goals for expanding educational access. This is becoming part of the strategy that institutions— colleges and universities as well as global institutions— are adopting to further their ambitions and their goals for advancing quality and access.

I mentioned India's National Knowledge Commission. . This is actually work that I did supported by the Hewlett Foundation. You will see some very, very clear recommendations that now have been accepted by the National Knowledge Commission.

They are part of the body of recommendations that the Indian Government has accepted which deal with open education resources and distance education. They have clearly identified this as a central strategy. At that time itself, we started thinking about network-enabled open education. To the point that Michael is making, one of the thrusts that you will see in those recommendations is to say, "Look, when we are talking about network-enabled open education, we are not talking about this as something supplemental to how real education happens. One of its goals is to see that what we have traditionally thought of as a second-class citizen, distance education, when it is represented as network-enabled open education, can become the central modality for delivering quality education everywhere. This is not an "also ran." It is how education can be developed.

With regard to a country like India, this is a country in a hurry, in a rush to grow— you know, there is a lot happening. When you think about the amount of demand there is for an educated workforce in every sector— transportation, laying roads, education, researching— there is no way in hell that you can multiply or replicate the traditional ways of delivering education to meet that demand. You could start a school, and I could give you numbers about the gap (about 50 million) between the number of children who are exiting the universal primary education model coming into secondary education and the kids who fall through the cracks because there aren't enough secondary schools. You can't build a school a day to meet that demand. When you talk about higher education, it becomes even more explosive.

Part of the Commission's recommendations was touched upon in Michael's message, and it is that we do not have to reinvent all parts of the wheel. You can really leverage this growing phenomenon of educational resources, and focus a lot of national energy on customization and localization and do all the long tail stuff. The point I am trying to make is that this has really become a central part of the kinds of investments India is also making in meeting its educational goals.

Now, this is 15 seconds of shameless self-promotion. I mean this movement is serious. The fact that it was becoming so big and so huge is what prompted my colleague, Toru Iiyoshi, who was at that time working in the Carnegie Foundation, to say, "Look, there is something happening over here. Many of these initiatives are sprouting. Can we invite all these players who are leading these initiatives to sit back and think about how this very significant movement can make a collective difference?" All these initiatives are taking off and all of it is represented in this anthology. Many of the authors, like Cathy Casserly, are present here. . The book is organized in terms of open technology, open content, open knowledge. These are not orthogonal concepts, just an organizing framework. The book really invites the various players to answer these two questions around the educational value proposition, and what might be factors that would lead these disparate initiatives to collectively make a transformative difference to education. We actually asked our authors not to write case studies of their individual initiatives, but to step back and look at it collectively—which they have done. By the way, this book—in terms of walking the talk—is available openly online at the MIT Press site.

I used those two guiding questions as a framework to see what might be some elements of the new value proposition and what might be some readiness factors. When I talk about the value proposition, "charity begins at home." So we talk first about OpenCourseWare. You heard President Vest reflecting on the time when

OpenCourseWare was launched, and all the statistics—the numbers, the millions, gazillions of hits, the accolades that were received. But I borrow a couple of poignant vignettes from the OpenCourseWare presentations which really speak to the transformative possibilities and even touch some of the issues of quality that have come up the last two days.

(See slide #12) You might have seen this before, about a student in Nigeria who looks at the course notes that are available in OCW and looks at the course outline and the questions. The entire set is present there. His comment is interesting, because he says that it helped him gain a deeper understanding of the material. This example shows that the resources that are available through OCW and other OpenCourseWare can actually be used as supplements, sometimes as a way to structure, to help students get that other perspective, and sometimes to help them understand deeply.

This is a different kind of a vignette, about a professor in Melbourne, Australia, who says, "You know, there is this very coherent presentation of this course." As you can sort of get from his comment, he is using it as a model. He is using this as a starting point for developing his own course. I introduced this slide yesterday after hearing the questions about quality. You can develop quality from scratch, but one thing about the open movement and materials like these in OpenCourseWare is that they are snapshots of real courses, and might I say, yield quality courses. They present good models. They can serve as benchmarks. They can be emulated.

Shigeru Miyagawa, a linguistics professor here at MIT who now chairs the OpenCourseWare Faculty Advisory, had, in the early days, a wonderful comment on the OpenCourseWare page. He said that we as academics know how to share our research, but what OpenCourseWare allows us is to share our pedagogy. How we share our pedagogy is through this very, very comprehensive representation of a course that is present as syllabus, outline, structure, the sequence of activities. These components serve as models of quality. There are other ways of getting quality from these resources, but I wanted to mention that this representation itself presents a starting point for how one might think about quality.

There are other things that we do which can speak to how OpenCourseWare might be used. Dave Pritchard pointed to some examples from the video, and I will touch upon that. Here is a very interesting example from one of our faculty members, Karen Willcox, who, to pick up Michael's point about "just in time," might introduce a refresher element just in time. When you want to do a refresher section— on, let's say, calculus in the middle of a fluid mechanics course in your third year --or you want to understand why you might be doing arcane triple integrals in your second year by pointing to something else three years down the road when you are doing transport phenomena— this is how these things might be relevant. So there are interesting ways in which to make the education experience richer, either by bringing in just in time, refresher materials for review, or to point out the relevance of the material that is covered now for the future. So these are the kinds of possibilities that these open education resources present.

When you think about the value proposition, again, I like to say— and I will try to illuminate this with some more examples— that the "access" case is pretty much clear. Suddenly you have this tremendously growing volume of educational resources of all

kinds, including full courses and learning objects. I am going to show laboratories, in case you thought it was only about accessing content. What it really does is increase the access vector, in terms of scale and quality, in tremendous ways.

I already warned Andy, when he quoted Sir John Daniel, that I was going to pick up on that quote, where John Daniel talks about how open education resources can really affect our traditional thinking about how access, quality and cost are related. Sir John has a wonderful way of talking about it. He talks about these three vectors: access, cost and quality. The way he presents this is that we always thought about this triangle as an immutable triangle, -- our traditional means implied that if you increase access, quality is going to suffer and if you increase quality, cost is going to get crazily high. What he points out, and what is being validated slowly but surely, is the fact that this iron triangle is indeed being rendered flexible because of network-enabled open education.

We can go into lots of philosophical discussion about this, but there has always been a very insidious connection between exclusiveness and quality—small institutions, small sizes, interpreted variously. Or you would have heard, "Oh, if you have 600 people in a class, quality is going to suffer." Maybe— through this intervention— not. Or others say, "If you bring in a lot of media-rich materials that will help different pathways to learning, the cost is going to go up." Perhaps it will not, if we actually engage the community in producing some of that, or in providing some of these experiences. The point that Sir John makes, that I again vehemently agree with, is that network-enabled education actually provides the opportunity to render that hitherto inflexible triangle flexible.

Yesterday we heard a lot about flexible learning. One of the things that it is doing, through all the examples that we heard about, is really shifting from teaching to learning. We used to think that was just an "eduspeak" buzzterm that educators use ---about "shifting from teaching to learning". But what you are really seeing is that in learning— flexible learning, just-in-time learning, anytime-anywhere learning— suddenly there is a very, very palpable shift from thinking about teaching to learning in all its modalities, all its localities. That speaks to the access and quality influence of open education.

There are other two areas that I have pointed out, in terms of the value proposition. It really allows us to intelligently blend physical, virtual, situated online experiences in interesting ways, and I will show you an example. The third aspect that Dave was pointing to was the opportunity to do continuous improvement of the materials and of the pedagogy, if you actually built overlays and engaged the community and networks on top of these available resources. There is a very good example. Carnegie Mellon launched their open learning initiative, which is a whole set of resources which actually use a closed-loop kind of model in order to change the experience, change the content, and change the delivery, based on the experiences that students are reporting. So it speaks to that kind of continuous improvement. Those opportunities are possible.

Boundarylessness is the other thing I wanted to point out. Typically, when we think about boundarylessness, we mean geographical boundaries. I am thinking about the possibilities that we are creating for boundarylessness in terms of the traditional boundaries that exist between disciplines, between research and teaching. We are able to bring open education resources to transcend those boundaries.

A very favorite example of blended education that I point out from MIT is iLab. Jesus del Alamo, the inventor of the idea of iLabs, really says iLabs is about Internet-based, browser-based access, to real laboratories— not simulations and not virtual labs. So students in Singapore, in Sweden, in Africa, in China, in India are accessing labs, for instance, that are available here at MIT. They set the parameters and look at results. They actually conduct experiments. In fact, you see the network analyzer equipment over here. There is a "benign" nuclear plant over there. We have our own nuclear engineering students, as well as middle school students through an NSF grant, who have access to those labs. The thing about iLabs is not the fact that there are four or five or six labs at MIT which people all over the world are able to access, but the fact that the architecture allows labs anywhere to be set up and made available. You can see the implications for vocational education. We are making sure that when we talk about network-enabled online education, we are not just talking about access to content; we are talking about good end-to-end experiences.

I will give two very quick examples, and then we will move on. Dave mentioned this in his talk about using video (See slide #17). This is a technology that leads towards the vision that he was presenting. It comes out of research work that Professor Jim Glass in Computer Science does. What this allows us to do is to really search the transcripts that are available. It is an automatic transcription technology. It uses voice recognition and A.I. techniques. It is not only for automated transcription, but it allows you to search on particular keywords so that you can go to specific segments of the video. So if you have 21 hours of video-based lecture, let's say, from Professor Walter Lewin—and those of you who have seen him will agree that if not deserving of a teaching award, he is at least deserving of an Oscar— and you want to go to all the segments of the lecture that deal with angular momentum, or gravity— pick your topic—you can search the transcripts. The yellow-highlighted things that you see are to search the transcripts and get to those particular video segments. You can see the implications: I have missed a class and I want to go review the segments on a particular topic, so I can go back and review it. Take a topic like angular momentum. It starts in physics, but it might need to be covered in mechanical engineering. You can go to those segments. So you can start leveraging content across courses. That is the kind of boundarylessness that is enabled. If you overlay what Dave said on top of that, you see how you can start thinking about mapping concepts that need to be learned with particular educational content. You can harvest them and do the mapping. Those are some of the possibilities.

Because this is a very international audience, I am interested in showing this very exciting initiative that we are engaged in. We are working with the School of Architecture and Planning at MIT, and a group in India called the Indian Institute of Human Settlements. It is an urban planning institute that is being set up. They have really embraced openness in all its dimensions. They say, "Look, for scale, and for the kind of inclusiveness we want in our institutions"—and when I talk "inclusiveness" in India, we are talking about multiple languages and multiple states— "we really think openness is the answer, as in making our curriculum open, making sure things are translatable." So when we showed them the possibility of Spoken Lecture browser, they immediately jumped to this example. They had all these video lectures that were being transcribed, but they got very interested in the translation capabilities. You will see as this video goes

along that the transcription is being translated automatically to Hindi. You can actually search the segments in Hindi, and it will go back to the segments. This is, by the way, Professor Bish Sanyal, a colleague of ours in the School of Architecture and Planning. It will do a keyword search. So it is doing the same thing, the transcription of the lecture.

(See link on slide #18— http://spokenmedia.mit.edu/demo/iihs/)

That word "*niyojan*," by the way, means "planning." It goes to the segment that talks about planning, in real time. Imagine: this is happening. And we have engines. About four or six years ago, in one of the early LINC conferences, Dick invited Vijay Chandru, one of his colleagues, who showed the Simputer. It is a hand device, which has an engine to do text-to-voice translations in 13 Indian languages. Imagine the Spoken Lecture browser, combined with the text-to-voice translation in 13 languages, and suddenly you can start seeing the possibilities of network-enabled open education.

There is a lot to tell. I won't go through all that, in the interest of time. What I will leave you with is that there are wonderful things about finding resources in the network. How do you search them? How do you use recommenders that allow you to find related resources? These are the kinds of things that we are working on at MIT. If you look at a resource for a course, you search the Web, you search Wikipedia, or you search select repositories, and you get to a resource. But you also want to find what related resources are there for a topic, because people learn in different ways. Some people are visual learners. I used an example the day before yesterday: when my father taught me probability and statistics, I didn't understand a thing, but when my wife taught it, I got it. So I might want to go look at related resources on a particular topic. That is the recommender that you see. Here it's just hitting against our OCW site. When you find a particular resource, you might find related resources, which might provide alternate pathways. This is a topic that Professor Larson is passionate about—alternate pathways for people to learn, in a guided mode.

You can start thinking about the student experiences. You find all these resources. I plunked that. This was a resource that had to do with Nepal. As a student, I might say, "Well, where is Nepal?" I might pull up Google Earth and try to place that in context. I might say, "What has happened historically?" and use some feature like Timeline. So there all kinds of these things that provide contextually relevant education through the kinds of affordances that networks and open education resources provide. I just wanted to give you a glimpse of the student experience over here.

I will just touch on readiness, and leave it for discussion. When we talk about readiness, Michael already spoke to the culture and the context. The fear that we have is a fear of extensive abundant resources. Picking up from Coleridge's rhyme, there is "Water, water, everywhere, but not any drop to drink." Can we find relevant resources? Can we find relevant resources in time? Then if we find them, can we get them, because these resources are sometimes trapped in particular technology implementations? If not, they are bounded legally, so they are not accessible. Even if you can get them, and you find the relevant resource, using the recommenders, et cetera, can you get them? If you can get them, can you use them? Can you integrate them with all the other stuff that you are using, that you are teaching with? These are the problems we are working on at MIT. Actually, some of this is driven by Dave Pritchard. How do we make sure that we find

content that can be easily mapped to different concepts that we want physics students to learn? You saw a whole list of concepts over there.

The second dimension, cultural readiness, is a bit trickier. I will just make one statement: Many of our practices in education are trapped in a model of scarcity. If you look at our business models, our delivery models, our situated-learning models, they all assume that resources are limited, teachers are limited, contact hours are limited and lab equipment is limited. All our models of delivery and business models are premised on this model of scarcity. Now we have this overwhelming abundance, or growing abundance, of resources and communities. We are not just talking about resources that are suddenly widely available. Through social networks, you have a whole bunch of relationships, community, and people. The readiness challenge for us is — how do we productively leverage this abundance? What is it that we do as teachers that takes advantage of the fact that there is all this stuff available over there? Do we need to do all the translation? Can we leverage peer-to-peer communities to do a lot of the sense-making and understanding, so that we do not have to do it all ourselves and so that we can start thinking about how to shift the production function of education? That is the kind of readiness challenge we have, if we are to realize this wonderful potential.

I will stop there and say, “That’s my story, and I’m sticking to it.”